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Patent Claims

Liquid-crystalline medium based on a mixture of polar compounds of
 negative dielectric anisotropy, characterised in that it comprises at least one compound of the formula I

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$$R^{11}-(A^1-Z^1)_m - O$$
 $F F F F (Z^2-A^2)_n-R^{12}$

in which

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A¹ and A² are each, independently of one another,

- a 1,4-cyclohexenylene or 1,4-cyclohexylene radical, in which one or two non-adjacent CH₂ groups may be replaced by -O- or -S-,
- b) a 1,4-phenylene radical, in which one or two CH groups may be replaced by N,
- c) a radical from the group consisting of piperidine-1,4-diyl, 1,4-bicyclo[2.2.2]octylene, naphthalene-2,6-diyl, decahydronaphthalene-2,6-diyl, 1,2,3,4-

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tetrahydronaphthalene-2,6-diyl, phenanthrene-2,7-diyl and fluorene-2,7-diyl,

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where the radicals a), b) and c) may be monosubstituted or polysubstituted by halogen atoms,

Z¹ and Z²

are each, independently of one another, -CO-O-, -O-CO-, -CF₂O-, -OCF₂-, -CH₂O-, -OCH₂-, -CH₂CH₂-, -(CH₂)₄-, -C₂F₄-, -CH₂CF₂-, -CF₂CH₂-, -CF=CF-, -CH=CF-, -CF=CH-, -CH=CH-, -C≡C- or a single bond, and

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m and n

are each, independently of one another, 0, 1 or 2, where $m + n \ge 1$.

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 Liquid-crystalline medium according to Claim 1, characterised in that it additionally comprises one or more compounds of the formulae IIA and/or IIB

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in which

 R^2

is an alkyl or alkenyl radical having up to 15 C atoms which is unsubstituted, monosubstituted by CN or CF_3 or at least monosubstituted by halogen, where, in addition, one or more CH_2 groups in these radicals may each be replaced, independently of one another, by -O-, -S-, \longrightarrow , -C \equiv C-, -CO-,

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-CO-O-, -O-CO- or -O-CO-O- in such a way that O atoms are not linked directly to one another,

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р

is 1 or 2, and

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is from 1 to 6.

Liquid-crystalline medium according to Claim 1 or 2, characterised in
 that it additionally comprises one or more compounds of the formula

$$R^{31}$$
 A H R^{32} III

in which

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 ${\sf R}^{31}$ and ${\sf R}^{32}$ are each, independently of one another, a straight-chain alkyl, alkenyl, alkylalkoxy or alkoxy radical having up to 12 C atoms, and

$$-$$
 is $-$ or $-$ H $-$

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4. Liquid-crystalline medium according to one of Claims 1 to 3, characterised in that it comprises one, two, three, four or more compounds of the formula I.

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 Liquid-crystalline medium according to one of Claims 1 to 4, characterised in that the proportion of compounds of the formula I in the mixture as a whole is at least 5% by weight.

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 Liquid-crystalline medium according to one of Claims 1 to 5, characterised in that the proportion of compounds of the formulae IIA and/or IIB in the mixture as a whole is at least 20% by weight.

- 7. Liquid-crystalline medium according to one of Claims 1 to 6, characterised in that the proportion of compounds of the formula III in the mixture as a whole is at least 5% by weight.
- 8. Liquid-crystalline medium according to one of Claims 1 to 7, characterised in that it comprises at least one compound selected from the formulae 11 to I36

$$R^{11} \longrightarrow O$$

$$F F F$$
alkyl

$$R^{11} \longrightarrow 0$$

$$F F F F$$

$$R^{11}$$
 O alkyl 13

$$R^{11} \longrightarrow F F F$$

$$R^{11} \longrightarrow O \longrightarrow Alkyl \qquad \qquad I5$$

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$$R^{11} \longrightarrow 0 \longrightarrow 0$$

$$F F F F$$

$$16$$

$$R^{11}$$
 O alkyl 17

$$R^{11}$$
 F
 F
 F
 F
 F
 F

$$R^{11} \longrightarrow 0$$

$$F F F F$$
alkyl

$$R^{11} \longrightarrow 0$$

$$F F F F$$
110

$$R^{11} \longrightarrow O$$

$$F F F$$
alkyl
$$I11$$

$$R^{11} \longrightarrow 0$$

$$F F F$$
112

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$$R^{11}$$
 O alkyl 113

$$R^{11} \longrightarrow 0$$

$$F F F F$$
114

$$R^{11} \longrightarrow 0$$

$$F F F$$

$$I16$$

$$R^{11}$$
 O alkyl 119

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$$R^{11} \longrightarrow 0$$

$$F F F F$$
120

$$R^{11} \longrightarrow O \longrightarrow alkyl$$
 I21

$$R^{11} \longrightarrow O \longrightarrow Alkyl$$
 123

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$$R^{11}$$
 O alkyl 125

$$R^{11} \longrightarrow 0$$

$$F F F F$$

$$126$$

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$$R^{11} \longrightarrow 0$$

$$E = E$$

$$128$$

$$R^{11} \longrightarrow 0$$

$$F F F F$$
alkyl

$$R^{11} \longrightarrow 0$$

$$F F F F$$

$$I30$$

$$R^{11} \longrightarrow 0$$
 alkyl [31]

$$R^{11} \longrightarrow 0$$

$$F F F F$$

$$I32$$

$$R^{11} \longrightarrow 0$$

$$F F F F$$
alkyl
$$I33$$

•

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$$R^{11}$$
 O F F F F F F F F

$$R^{11}$$
 O alkyl 135

in which

and

R¹¹ is as defined in Claim 1, and alkyl is a straight-chain alkyl radical having 1-6 C atoms.

- 209. Liquid-crystalline medium according to one of Claims 1 to 8,characterised in that it essentially consists of
 - 5-30 % by weight of one or more compounds of the formula I
 - 20-70 % by weight of one or more compounds of the formulae IIA and/or IIB.
- 10. Electro-optical display with active-matrix addressing based on the ECB, PALC or IPS effect, characterised in that it contains, as dielectric, a liquid-crystalline medium according to one of Claims 1 to 9.

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